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File: USPT

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TITLE: Cleaning method and apparatus for the same

Brief Summary Text (9):

To solve the above problem, super-pure water alone or in combination with ultrasonic-waves is employed for the cleaning step in TFT-LCD substrate manufacturing, instead of the above acidic or alkaline solution. Super-pure water is highly purified such that micro-particles, colloidal microorganisms, organic substances, metal, ions, dissolved oxygen and the like are removed to extremely low concentrations by membrane equipment such as ultrafiltration membrane and reverse osmosis membrane, ion-exchange equipment, ultraviolet irradiation equipment, and the like. By the use of super-pure water, substrates or electrodes will not corrode during the cleaning step, and furthermore, no contaminants are derived from super-pure water.

Brief Summary Text (10):

However, super-pure water has low cleaning power and is not efficient in the removal of contaminants. In addition, super-pure water cannot removed certain types of contaminants from the substrate surface. Therefore, to clean a substrate using super-pure water, for example, the following procedures are required: the substrate surface is exposed to ultraviolet irradiation in the presence of ozone to remove organic substances, brushed for removing large particles, washed with super-pure water in combination with ultrasonic-waves to remove small particles, and then washed with super-pure water.

Brief Summary Text (22):

Examples of cleaning methods are: a batch cleaning method in which subjects are immersed in an aqueous cleaning solution; a method in which an aqueous cleaning solution is applied to subjects by showering or jetting; a spin cleaning method in which a subject is rotated at a high speed while applying an aqueous cleaning solution to the center of rotation; and a flow cleaning method in which an aqueous cleaning solution flows down a subject. In addition, the cleaning efficacy can be improved by combining the above methods with ultrasonic-waves or ultraviolet irradiation.

Detailed Description Text (13):

Examples of cleaning methods for subjects in the cleaning chamber 16 are: a batch cleaning method in which subjects are immersed in an aqueous cleaning solution; a method in which an aqueous cleaning solution is applied to subjects by showering or jetting; a spin cleaning method in which a subject is rotated at a high speed while applying an aqueous cleaning solution to the center of rotation; and a flow cleaning method in which an aqueous cleaning

solution flows down a subject. In addition, the cleaning efficacy can be improved by combining the above methods with ultrasonic-waves or ultraviolet irradiation.

Detailed Description Text (51):

The cleaning effect of each method was evaluated from the particle removal calculated from the number of particles adhering to the substrate surface. The scattering of laser light irradiating the substrate surface was measured using a light receptor to calculate the number of particles adhering to per 100 cm.^{sup.2} of substrate surface.

Detailed Description Text (62):

Examples of cleaning methods in the cleaning chamber 16 are: a method of jetting the aqueous cleaning solution to a subject; a cleaning method in which the aqueous cleaning solution flows down a subject; and a method of jetting the aqueous cleaning solution to a subject while rotating the subject. These methods may be conducted in combination with ultrasonic-waves or ultraviolet irradiation. When using ultrasonic-waves, the aqueous cleaning solution is supplied to the cleaning chamber 16 after passing through a ultrasonic vibration device.

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